

clay, or humus layers in greens have been cited as reasons for rebuilding greens. Nobody can deny that this is the quick way. With the modern tools now available, the mat can be eliminated and the imbedded layers destroyed over a period of several years. Improved putting quality will result right from the start. Maintenance will become progressively easier.

Sand and other layers are best destroyed by using one of the several types of aerifying machines which are now available. After each operation, roots will go down through the layer in the aerifier holes. Before long there will be enough deep roots to keep grass from wilting quickly in hot weather. More frequent topdressing than would be necessary otherwise, is highly desirable also to build a deeper column of soil.

The problem of thatch is simple when recognized early which is before the stems start to undergo decay. The surplus grass can be removed in spring or early fall by alternate cross raking followed by close cutting each time.

Removal of surplus grass should not be attempted in hot weather. When done in the spring, it should not start until about the time grass is ready to renew its growth. An earlier start may delay recovery whenever the spring is unusually dry. There should be enough time in the fall for grass to recover before the onset of winter.

Topdressing would seem like the logical way to treat greens where the thatch is peat-like in character. Nothing could be worse because it is more difficult to destroy the organic matter of the imbedded layer. Topdressing should wait until it will make contact with the soil below. The organisms responsible for the destruction of soil organic matter must do the job. These organisms thrive in the presence of air because they need free oxygen. They work best when the reaction is at or near neutral. Enough aerification to introduce air and an occasional application of hydrated lime at not more than 2 to 5 lbs. per 1,000 sq. ft. is sound procedure and has produced desired results on many badly thatched greens.

Hydrated lime is better for this purpose than ground limestone because of its greater solubility. It reacts quickly with the organic acids which are intermediate decay products in the conversion of organic carbon in soil humus into carbon dioxide which is a gas.

After the peat-like layer is destroyed, or

## COMPLETES AERIFYING JOB



Wilbert Waters, supt., Inverness Club, Toledo, O., put a chain drag back of his Aerifiers when he was giving his fairways aerifying and thatch-removing treatment. Plugs were pretty well broken up and worked in as a light topdressing.

nearly so, topdressing can be resumed. Before it is applied, the green should be spiked deeply with a spike disc, or it should be aerified so the topdressing will make contact with the soil.

Badly contoured surfaces, a poor location, the wrong kind of soil and a poor kind or strain of grass have been mentioned as justification for rebuilding a green. The importance of having the right kind of grass was dealt with first, including greens of *poa annua*. When it is the only grass on the green, re-turfing or rebuilding is justified except in a very few localities of very favorable climate.

### Rebuilding Is Only Answer

Rebuilding is the only way to change a badly contoured green. Severe gradients and innumerable slight pocketed areas make the green bad for play and for maintenance. The contouring may limit the amount of cupping area to the point where the turf cannot withstand the traffic of heavy play. Pounded water in slight pockets causes trouble in summer and in winter.

A green should have enough character to test the skill of the golfer. Good design from that standpoint is the architect's responsibility. The contours should not be so severe that the modern greens mower cannot be used to cut in any and every direction.

The design should provide more than one path for run-off of surplus water during and after heavy rains. Downward percolation is too slow even in the best kind of soil, so the importance of designing a green to insure rapid run-off in several

directions cannot be overemphasized. That is the way to have greens ready for play immediately or soon after rain stops.

The necessity for rebuilding a green because of its location is usually because of turf maintenance troubles rather than from the strategy of play. These greens are placed in spots where there is no air drainage, or occasionally on slopes subject to seepage or overflow from surface run-off. Each case is a local problem.

The surface soil on the greens of many new courses is too heavy especially in localities where it is hard to get, or hard to make the right kind of soil. The usual practice is to build better soil in the green by more frequent topdressing at generous rates. This is a slow way. It works best on greens which are out in the open. Rebuilding is the better and quicker way for greens which tend to stay overly wet and for those in low-lying confined spots.

#### **Start Temporary Green Early**

A good temporary green should be provided wherever possible for play during reconstruction and afterwards until the grass is well established.

The temporary green must be started sufficiently early so it will have a decent surface. Customary practice is to cut the existing fairway grass short, apply enough topdressing to provide a smooth surface and seed with bent, redtop or a combination of the two.

Where there is no place for a temporary green, sodding may be preferable to seeding or planting stolons. It will cause golfers less inconvenience. When the new green is built in a different location, the old one can be used until the new one is ready for play.

In rebuilding any green, good drainage is imperative and that applies to surface and internal soil drainage. The role played by surface run-off during wet periods has been discussed. Good internal soil drainage is important also. It insures speedy, downward movement of soil water after surface run-off has removed most of the water from heavy downpours.

Tile drains are not needed for greens located in gravelly or open textured subsoils. The situation is different where the subsoil is of a clay nature. Then the herringbone type system should be installed. The principal main should be in the direction of the general slope, and should bisect the green if possible. Laterals should cross the line of slope and should be closely spaced, at not to exceed 15 ft. The lines should be two to three ft. deep and the trench should be back-

filled with pea gravel to within 6 to 8 in. of the surface or to where the blanket of topsoil begins.

Some architects and golf course superintendents favor a gravel blanket between the subgrade and the topsoil. It is of no value where the subsoil can dispose of water quickly. The situation is different on tight, compact subsoils especially in localities of hot humid summers. A herringbone system of tile should be placed immediately underneath, so the trench becomes a part of the blanket. The tile lines will remove water quickly and enable the gravel blanket to move water rapidly. Without the tile the gravel blanket may become a false water table.

#### **Topsoil Composition**

The topsoil should be six to eight in. thick or more after settlement. It should be a medium sandy loam with not more than 20 per cent by volume of organic matter. Few people realize the relative effects of sand soil and humus on soil texture. Fine sand packs as badly as clay; the same is true of muck-like humus. It takes very little clay to change a sand, and by the same token, large amounts of sand must be used to have any effect on clay. Those who use ratios of two parts soil and one of sand, and even equal parts of each, seldom achieve the desired result. More often, two parts sand to one of soil and one of humus is needed to make the right kind of topsoil. The sand should be sharp and reasonably coarse with a gradation of sizes from coarse to moderately fine. The soil should be a friable garden loam and the humus should be fibrous. The final mixture should have a springy feel when squeezed in the palm of the hand.\*

Lime, if needed, and fertilizer should be worked into the surface soil during final seed bed preparation at rates suggested earlier on re-turfing except that the nitrogen should be used before seeding or planting the stolons. The same procedure should be used; namely, light rolling to firm the soil and disclose slight pockets.

It is easier to get the surfaces right at this point rather than after the grass starts growth. Light raking just before seeding or planting is advisable to prepare a good bed. Surfaces must be kept continuously moist after seeding or planting stolons until the grass is well started. Best practice is to hand-water three or four times every day using a rose nozzle with a fine spray. Not more than 10 or 15

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minutes need be spent on the green each time.

### Selection of Grass

Selection of the right grass is important. The choice for those who seed is limited to seaside or one of the colonials. Polycross now called Penncross is not available and will not be for another year in all probability. Seaside is frowned upon in the far North because of its susceptibility to snow mold. It does not do too well in regions of prolonged hot humid weather. Colonial behaves badly as a rule under these conditions.

Cohansey (C-7) is doing well in Oklahoma and Louisville. It has many staunch champions in those regions. The region for it should include the belt from Washington to Kansas City. Arlington (C-1) and the mixture of Arlington (C-1) and Congressional (C-19) are behaving well. Those who use the mixture, plant one bushel more of Arlington than Congressional because it spreads more slowly. Arlington is less popular when used alone farther North, but Congressional is liked because it resists snow mold and holds its color well in fall and spring.

Toronto (C-15) has its admirers and

Washington is still doing well on many courses. The newly named Pennlu selection promises to be another good bent. It has been outstanding at Penn State and has done well at Purdue.

### Danner Solves Weed Problem

**G**OLFERS' demand for perfect turf conditions regardless of weather, money and labor available, and the golfers' own neglect of courses continues to increase.

In amazing jobs of meeting this demand the golf course superintendents have employed many resourceful and effective ideas this year. Turf problems in many areas were accentuated by prolonged drought which always makes the weed situation on golf courses troublesome. Some progress in contending with labor shortage was reported.

Charlie Danner, supt., Richland GC, Nashville, Tenn., tells of a satisfactory solution of a persistent weed problem.

Says Danner:

"This past season I have been much impressed and pleased with the work done at my club on weed control. Until this year crowfoot has been one weed we have had to fight the hardest on our Bermuda

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greens and tees. Now we have chemicals to eliminate this weed.

"This year we had wonderful success controlling crowfoot using 3 oz. PMAS mixed with 1 oz. 2,4D in 5 gal. water to each 1000 sq. ft. This mixture was sprayed on with a power sprayer. Two applications three weeks apart completely killed all crowfoot in our greens. We also treated the fringes and approaches to the greens with equal success.

"This treatment turned the Bermuda grass slightly off color and slowed the growth of the grass but after one week the Bermuda regained the color and started growing vigorously again.

"Later in the summer after observing results on the greens we started spraying our tees and by this time we were dealing with mature crowfoot plants but we found that the chemicals worked equally as well on mature plants as on seedlings.

"It has been quite an improvement over the days when we had to hire extra labor to take crowfoot out of the greens with a knife."

### Williams Outlines District Course Maintenance Report

Robt. Williams, supt., Beverly CC (Chicago dist.) and chairman of the Educational committee of the Golf Course Superintendents' Assn., prepared a paper on golf course maintenance in the Chicago district which was presented at a spring meeting of the Minnesota GCSA.

Williams' picture of Chicago district maintenance was printed in GOLFDOM.

We've found that the Williams' outline is sound editorial procedure in getting informative material for GOLFDOM's readers and in providing supts. with a working basis for reports they prepare on regional conditions.

Here's the outline:

#### A.—INTRODUCTION

- a.—Size of the area (miles long and wide.) Number of courses.
- b.—General topography of the area (elevation, etc.)
- c.—Climatological data (winds, temperatures, humidity, snowfall, rain and length of growing season.)
- d.—Soil types of the area. (Amendments used in new construction of greens etc.)

#### B.—LABOR

- a.—Supply, rates, benefits, annual

employment, number men employed at average course, off season work,

- b.—Any special problem of labor; training etc.

#### C.—GREENS

- a.—Strains of grasses generally used.
- b.—Disease organisms most prevalent. Controls.
- c.—Insects and control.
- d.—Topdressing; frequency and amount.
- e.—Thatch or grain control.
- f.—Irrigation. (Methods and frequency.)
- g.—Height of cut. (Private or public course. Seasonal change.)
- h.—Traffic. Amount of play.
- i.—Fertilizing practice; amount, frequency and kind.
- j.—Weeding. (Crabgrass, clover, etc.)
- k.—Aeration. Need, type equipment, etc.
- l.—Rebuilding greens. General summary of amount of rebuilding done by average club.
- m.—Special features of green maintenance such as collars, double greens, etc., and problems.

#### D.—TEES

- a.—Strains of grasses used.
- b.—Height of cut.
- c.—Fertilizer, amount etc.
- d.—Fungicide applications.
- e.—Divot repair (methods, results.)
- f.—Reconstruction; size, grass type, shape etc.
- g.—Special problems.

#### E.—FAIRWAYS

- a.—Grass species, height of cut, aeration, irrigation, fertilizing, insect and weed control.
- b.—Special problems.

#### F.—ROUGH

- a.—Grass types, height, fertilization, insect and weed control.
- b.—Special problems.

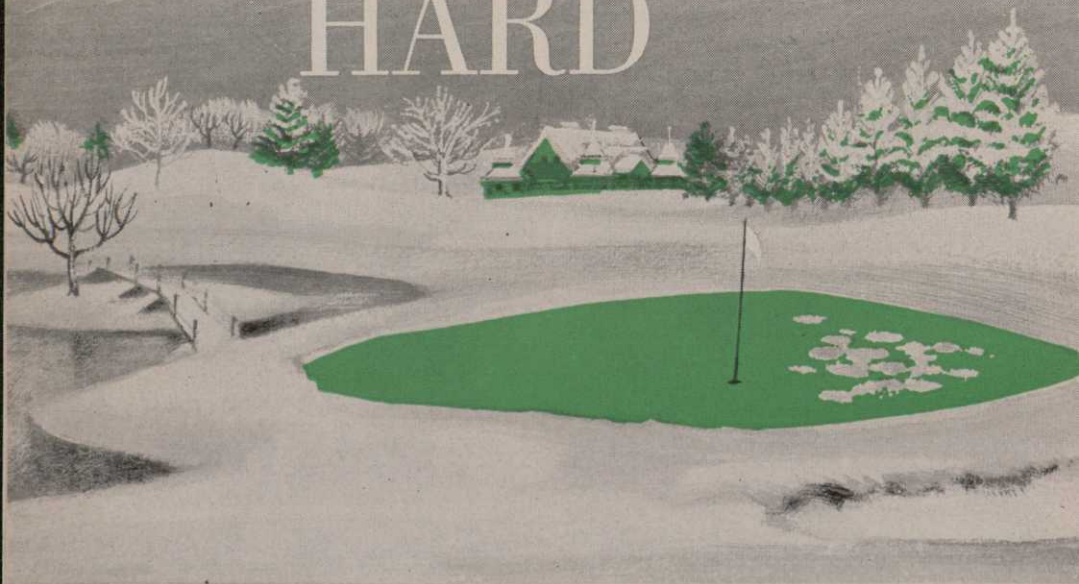
#### G.—TRAPS

- a.—Type sand, lips, banks and refurnishing of sand.
- b.—Trend toward elimination of some?

#### H.—LOCAL ASS'N. ACTIVITIES

- a.—Advisory committees, constructive suggestion committees, educational, research and publication work.
- b.—Cooperation with district golf ass'n. and USGA.
- c.—National GCSA affiliation and benefits.
- d.—Local meetings etc.

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## Encanto Short Nine Eases Phoenix Golf Congestion

For years Phoenix, Ariz., and its surrounding communities have suffered from a lack of municipal golf course facilities. Three years ago the area's 300,000 people had only the 18-hole Encanto Park course on which to play. Private and semi-private country club courses relieved only part of the burden on the Encanto layout.

Faced with a shortage of available land and funds for another 18-hole layout, the City of Phoenix compromised by opening the Encanto short nine, built in 1952 on a 26-acre tract adjoining the Encanto 18.

The new course is not the pitch-and-putt type, common in many other cities, but a 1,720-yard course with six par three holes measuring 95, 150, 140, 156, 180 and 175 yds. and three par four holes. The three longer holes are 267, 255, and 312 yds.

In its two years of operation, the short nine has proved a huge success, both financially and as a means of relieving congestion on the 18-hole course. It has been especially popular with thousands of senior golfers who flock to the Phoenix area as tourists during the months from October to May. Men and women over 50 find the short nine ideal because they can play it without tiring.

Youngsters and beginners find in it a course they can play without encountering an excessive number of discouraging hazards. For all golfers, young and old, who formerly were hesitant to play for fear of holding up other golfers on the crowded 18-hole course, it has provided a place to play.

"The course was planned for these people," explains Pro Jack Morrison. "There are virtually no hazards, the course is flat and easy, and almost anyone can play it in less than 40 strokes."

Green fees were set at 50 cents per round to encourage play. In its first year, more than 60,000 rounds were played, and during the year ending July 1, 1954, the figure passed the 70,000 mark.

The big play, coupled with the low cost of maintenance, has made the course a more profitable operation than the 18-hole layout. Morrison has only two full-time men on the maintenance crew, as compared with 12 for the longer course. Yearly maintenance has cost less than \$14,000, leaving a gross annual profit of about \$16,000.

One gratifying feature of the short nine is the way its greens have held up. De-



Encanto short course pro Jack Morrison and a short golfer.

spite the fact that tee shots can hit the green on almost every hole, and the traffic on the greens is terrific, not a single short nine green has been lost, even during the critical summer months.

Morrison explains that fact by pointing out that all nine greens were prepared specifically for seaside bent grass when they were built. On the 18-hole course, in contrast, the greens were built 20 years ago for bermuda and sufficient drainage for bent was not provided. As a result, the long course has had greens grief since changing to bent two years ago.

Cedric Austin, director of the Phoenix parks and playgrounds department, and a number of Phoenix golfing enthusiasts including Encanto pro Milt Coggins, helped work out the specifications for the short nine three years ago. Total cost of the project was just over \$50,000, including \$34,400 for construction, \$4,000 for architect's fees, \$11,700 for maintenance and other equipment, and \$750 for supplies.

The short nine has not solved the Phoenix golf facilities shortage. Approximately the same number of golfers play the 18-hole course as before, and there still is a formidable waiting list for tee times in the peak winter months. But the short nine has helped the situation by providing a place for the old, the young, and the less experienced golfer to play. And it is long enough to prove interesting for anyone.

Phoenix parks officials feel their compromise solution to the facilities shortage might be adopted with profit by other cities facing the same problems, although the short course never will substitute for full-sized course facilities.

# Bermuda Fairways Made Good\*

By WARD L. WOOD

Supt., Everglades Club, Palm Beach, Fla.

**I**F YOU WANT to maintain good fairway turf, economically, the time to start is before the fairway is constructed. See to it that the turf has the proper soil, water system, and surface drainage.

Without these three things it will be necessary to have top and costly maintenance. It is far cheaper over a period of years to build right in the first place. And, of course, this works backwards too. If you have a good soil, irrigation system, and proper surface drainage, without proper maintenance, you will still have a poor grade of turf.

I do not mean to infer that it is impossible to develop and maintain a good fairway on poor soil. This can be done but it requires a much larger yearly budget for labor and maintenance; such as more frequent cultivation, fertilization, and weed control. This is economically unsound. One of the best examples of this that I know is my own course which is being gradually transformed into fine fairway condition.

When I took over at the Everglades Club in January, 1948, the fairways were at least 60 per cent weeds, including every type of weed known to man in South Florida.

Starting in early spring we sprayed them with a boom spray three times, at 10 day intervals, using sodium arsenite at from two to three times recommended strength.

We aimed to spray when the ground was moist and the leaves of the weeds were in a succulent condition so they would absorb the mixture readily. We used from 10 to 12 pounds sodium arsenite each time and approximately 200 gals. of water per acre.

Ten days after the last or third spraying we renovated severely with a disc harrow, following the renovation with a heavy application of fertilizer. The actual amount per acre of nitrogen was 120 lbs., of phosphoric acid 90 lbs. and of potash 60 lbs.

One month later we sprayed them twice at three week intervals, with a 2,4-D ester type formulation at recommended strength to get rid of weeds that sodium arsenite

\*(GCSA conference address)

did not affect; (such as, dicondra, pennywort, nut grass, etc.)

Sodium arsenite was used first because it will eradicate most of the weeds. It weakened dicondra and other weeds by defoliating the plants so they were more easily killed by 2,4-D. But the surface foliage of Bermuda was burned quite severely. The 2,4-D was used later on in the summer and took care of the few types that were not affected by the sodium arsenite, with very little injury to the Bermuda. To eliminate St. Augustine grass we found it best to spray with a mixture of sodium arsenite and 2,4-D.

After the sodium arsenite treatment, some sprigging in of Bermuda was necessary, but in most areas there was enough Bermuda to spread over, even where there had been a covering of St. Augustine grass.

I am mentioning these two weed control chemicals because they were the two I was and am familiar with. They did a good job for us. Others might have done as well, yet I am told my selection was and still is sound.

After two summers of this treatment we had fairways that we were proud of, and only spot spraying with a hand nozzle, or applying chemicals with a large paint brush was necessary.

## Chemical Reaction Varies

If you plan to carry out this program I would advise you to consult with someone who has had experience with weed control chemicals in your locality, as the reaction is different on various soils, types of grasses, and localities.

After obtaining good fairway turf, I think you should cut fairways at least once a week, and sometimes, under very favorable growing conditions, twice a week; as long as you cut any clippings at all. It is a known fact that the more you cut off the grass blades of Bermuda at the top, the more it will spread laterally and develop a good thick turf. I would say that a safe height would be between  $\frac{3}{4}$  and one inch, or lower if the turf will stand it.

In my opinion, the frequency of cutting is much more important than the height of



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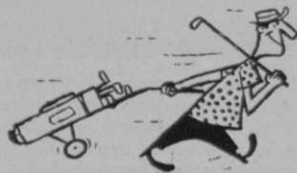
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At Penn State College Field day a leaf of a Merion bluegrass plant is examined under the glass by (L to R) Prof. H. B. Musser; Arden Jacklin, seed grower; J. M. Duich; and Dr. A. L. Land of Washington State College.

cut. The less leaf surface you can remove at a time, the less the shock is to the plant. Conversely, the more leaf surface removed at one cutting the more the grass is weakened.

Bermuda turf should be fertilized at least three times a year (or more if your budget will stand it) with a good grade of fertilizer at  $\frac{1}{2}$  to 1 ton per acre. Basic needs can be determined by having your soil analyzed. Remember always that the easiest and cheapest way to have good weed free turf is to grow grass.

### Water Thoughtfully

There is no one person who can tell you the exact amount, and how often to water on all courses. That is determined by different conditions on each course. The soil should be kept moist at all times, and care should be taken not to over-water. Over-watering can cause a very shallow root system; it will encourage sedge grass; other water grasses; and numerous detrimental weeds that thrive on too much moisture. Too much water can cause as much or more damage than not enough.

I would renovate severely in the early spring with an aerator, rotary hoe, or disc harrow — or all three, if necessary. This will thin out a heavy turf of grass and dead clippings, promote new healthy grass and encourage thin areas to cover over.

Then, renovate lightly in early fall, planning your fertilizer program to take place after each renovation.

### Routine Spraying

It seems to me that in the last ten years of developing better turf, we have also promoted bigger and hungrier worms and other insects, in larger quantities. It has proven very beneficial in my experience to carry out a routine spraying of an economical insecticide every 30 to 45 days, with a boom spray. On a limited budget, spot spraying of infested areas with a hand nozzle is justified and essential.

I particularly would like to stress the importance of routine maintenance. You all know the old saying about the man with the "Green Thumb". I think the secret of his "Green Thumb" is that he religiously waters, fertilizes, and cares for his turf. About 90 per cent of the time outside expert advice and so-called miracle remedies are not needed, provided routine and sound maintenance practices are followed.

### TURF RESEARCH FOUNDATION FORMED FOR MARKETING AID

Turf Research Foundation, with Frank Jacobi at general offices at 208 S. LaSalle St., Chicago 4, and Margaret Herbst at 101 Park Ave., New York, has been formed to develop markets for various strains of grass and issue "seal of approval" to seed producers.

The organization currently is engaged in sales promotion for Merion bluegrass and announces a Merion Bluegrass Assn. 16 mm. 12 minute Kodachrome sound film for sale to dealers.

### GOES HIGH AT TREES



National Shade Tree conference at Atlantic City (N. J.) CC outdoor demonstrations feature new equipment for tree care. Among new devices is the tower making work easier and better high in the trees.